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ABSTRACT

The history of industrial arts (IA) and technology education (TE) was examined to identify those points in the history of industrial education in the United States that have been interpreted in multiple ways or that are contradicted by other historical information. The evolution of IA was traced from the time period leading up to the 1920s, with special emphasis on the move toward TE in the late 1970s, IA and TE in 1982-84, and their current state. The contributions of key historical figures to the development of IA and TE were examined along with the following: the original conception of IA and debates over whether IA should be conceived/delivered as a type of general education or vocational education; organization of IA at various grade levels; the Industrial Arts Curriculum Project; the Science-Technology-Society movement and attempts at integrating math, science, and technology in TE; implications of the current emphasis on such integration for teacher training; enrollment trends in IA in a historical perspective; and proposals to remedy enrollment problems, including teacher recruitment and improvement of teacher education. (Contains 212 references.) (MN)

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Historical Problems in Industrial Arts and Technology Education

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HISTORICAL PROBLEMS IN INDUSTRIAL ARTS AND TECHNOLOGY EDUCATION.[1]

INTRODUCTION

In these times it is well known that a history is not a litany of dates, nor of names. History is no longer a sequence of empires, or of wars, or of kings, we are told—as if it ever was.

What *is* a history, then? Is it a series of trends? A chain of causes and effects? A procession of personalities? It would be, perhaps, unwise to suggest that a history might not be any of these; it would be equally unwise to suggest that it be *all* of these.

John Dewey is credited with suggesting that history be studied by identifying a problem in the present and investigating its causes (Nelson, Pooler & Drake, 1994; cf. Dewey, 1916). Perhaps a modification of this procedure is in order for the purpose of histories of educational movements such as industrial arts and technology education.

A Perspective on History

It is a well-worn adage that no idea is original, that nothing is entirely new. Often, in educational circles, a publication or speech will be regarded as a "turning point" in history, when in fact it may have been simply the culmination of months or years of prior works. The dissemination of a

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[1] P. Foster, University of Missouri–Columbia, December, 1994. This is a work in progress; please address comments to the author, 105 London Hall, UMC, Columbia, MO 65211.

publication's theories may have impacted practice in the educational field greatly, but even so, the publication should likely be seen as a point on a straight line or gradual curve, not as the vertex of a sharp angle—not as a true "turning point." The event of a publication or speech or curriculum should not be mistaken for the theory it supported. Cultivated theories do not materialize spontaneously; rather, they are the historical lines upon which events are the points which gradually conduct the line in new directions.

Yet at times these lines intersect. Two or more theories converge and it is difficult to trace each resultant line back through the intersection and linearly into the past. Is this theoretical synergy? Is the resulting theory really new? It seems certain that this intersection is more than a point on a line. It is this intersection that may serve historians as a event from which to begin studying a field of education. This is not a new idea. Toffler (1983) suggested that history is "governed...by the convergence of forces or tendencies that produce major changes" (p. 191).

Of course, the determination of possible starting points for a history does not provide a method of telling the history. The historian may identify major theoretical intersections in history, yet resort to litanies of dates and names to explicate this history. When this is the case an observer is correct to ponder the purpose of engaging in an inquiry into theoretical intersections in the first place.

The method of telling history advocated here is simply to identify the theories whose lines intersected, as well as several of the individuals considered central to the intersection, and, in presenting biographies of the individuals and descriptions of the theories, provide appropriate contextual information. In so doing, it can be hoped, the historian has "told the history." If this method has a strength, it is in the recognition that a history is a story

written for people about people. It may be about billions of people, most of whom are faceless and nameless, but a history is a story about people, the things they affect, and the things that affect them.[2]

Implications for a History of Industrial Arts and Technology Education

Applying this view to a history of industrial arts and technology education in the US, the observer may find that certain dates are quite important in the history of the field. In 1917, the Smith-Hughes Act was passed by the US Congress, recognizing the field of vocational education. In 1985 the American Industrial Arts Association renamed itself the International Technology Education Association. In 1947 William E. Warner presented the field with his *Curriculum to Reflect Technology*. Which of these events are points on a theoretical line? And which are true convergences?

Such decisions heavily impact the quality of a history. In the case of the history presented here, such events as the origination or the industrial arts

---

[2]Consider popular terms, such as *natural history*, which seem to suggest that history need not be about people. On the surface this term suggests that the natural world has a history, much as the social world does. Although the natural world has a past—and while natural events may be listed from furthest in the past to closest to the present—it does not have a *history* in the sense in which the term is used by historians.

The term *prehistoric* makes this abundantly clear: if history were the continuum of all time, there would be no prehistory. But there was a time before people wrote history. It follows, then, that history is a human endeavor and that it is fundamentally human in nature. In any event, history does not make people. People make history. In biographing important individuals—or those deemed to be important—a history can be constructed.

movement in the first quarter of the present century, and the movement to change the content base of the field in the most recent decades have been chosen.

Whether these are the most appropriate "convergences" to study—or whether they are convergences at all—is open to interpretation.[3] What is clear is that there are presently several difficulties in popular versions of the history of general-education industrial arts and technology education in the United States. Those difficulties will be the concern of this paper.

Regarding this Study

There are many rationales for studying history, and these may be divided into two broad categories: rationales for the individual study of history, and rationales for the maintenance of history. The former includes those arguments which have led to children learning history in school—these rationales hold that everyone must learn history. Those in the latter assert that history must be maintained by a profession, society, or culture for practical purposes, so that knowledge may be built upon and updated, or so that mistakes will not be repeated (see Dudley, 1994[4])

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[3]In fact, although it is well beyond the scope of this paper, the second of these movements may in fact somewhat be a reconvergence of certain trends which led to the first convergence mentioned.

[4] Dudley, while noting that "those that *do* know history are doomed to repeat it" (1994, p. 10), presented the practical conception thusly:

[note continued]

A maintenance-of-history rationale underlies this study. The purpose of this study is to identify those points in the history of industrial education in the United States which have been interpreted in multiple ways or which are contradicted by other historical information.

Limitations and Assumptions of the Study

This paper investigates portions of the history of general industrial education in the United States. Although some consideration is given to industrial education which is not entirely general in nature, and mention of programs outside the US is made where appropriate, these primary limitations should serve to focus the study.

The present century is the primary setting of this study. Of course, pertinent references are made to earlier time periods. In addition, special attention is given to the context in which industrial arts was conceived in the 1910s and 1920s, and this will require investigation of the final quarter of the nineteenth century. However, the bulk of the study concerns past seventy to eighty years.

The final limitation of this study relates to the explication methodology used here. As mentioned earlier, one may construct a history by selecting one or more convergences of trends. This study, then, is limited by the author's choices of points in the history of industrial education on which

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Squirrels don't know history and squirrels, if asked, would probably say that, on the whole, they had fine lives. But—observe squirrels closely. Twitch! Jump! Scurry! Squirrels live in a world of random potential disasters. Squirrels are constantly in a state of panic. Everything comes as a surprise to a squirrel. The reason is that squirrels do not know history. They live in the present, they live in a small world. When they dash for the nearest tree when there is a clap of thunder they do not know that their hysteria is unnecessary because in the entire history of squirrels, not one squirrel has ever been injured by thunder. I'm glad I'm not a squirrel (p. 11).

to concentrate the study. The reader may note that it is not assumed that these points are in fact convergences of significant trends.

It was, however, assumed herein that the area of education today known as "technology education" was in the past known as "industrial arts" (see, e.g., Lemons, 1988), although nothing related to similarities between the two programs was assumed. It was also assumed that an accurate history of industrial education in the United States can be told by concentrating on important events and the people commonly associated with them.

With these assumptions and limitations, the study was conducted. The results follow. They are divided into four sections: Foundations of Industrial Arts, focusing on the time period leading up to the 1920s; The Intent of Industrial Arts, focusing on the 1920s and thereafter; Technology Education—Historical Considerations, concerning the period beginning in the late 1970s, but focusing essentially on the time period 1982-1984; and The State of Technology Education, revisiting the 1920s and concerning the present. A summary follows these four sections and some questions are raised at the end of the paper.

Its Origination at Teachers College, Columbia University

As a general-education subject, industrial arts had its start at Teachers College, Columbia University (see Towers, Lux & Ray, 1966; McPherson, 1978; Zuga, 1994). A partial defense of this position is offered here (see also Foster, in press).

Teachers College professor Richards is generally regarded as having popularized the term *industrial arts* as a replacement for *manual arts* in 1904 (Bawden, 1950; cf. Snyder, 1992), although he himself may not have been a proponent of the overall Teachers College industrial arts philosophy (Zuga, 1994). Secondly, the "first...and only" definition of the subject was written by faculty members Bonser and Mossman (Brown, 1977, p. 2) and published in their book *Industrial Arts for Elementary Schools*; furthermore this book "has served well as the basis of our present day philosophy for correlation of industrial arts activity with subject matter content" (ACESIA, 1971, p. 50; see also Lemons, 1988; Householder, 1989). Finally, the social-industrial theory of industrial arts was developed at Teachers College by Bonser and College Dean Russell (Snedden & Warner, 1927).

Histories of Industrial Arts

Histories of the profession often begin by noting that "the teaching of technology as part of man's knowledge began when early cave man taught his son to master the skills needed for survival" (Hostetter, 1974, p. 209)—that "the origins of Technology Education preceded written history" (Householder, 1989, p. 11; see also Martin & Luetkemeyer, 1979). Snyder's (1992) historical treatment begins with technological developments during

the stone age; Barlow's (1967) with ancient Sparta. There are notable exceptions to this tendency (e.g. Bennett, 1926; Barella & Wright, 1981). In addition, most histories tend to concentrate on a succession of personalities in explicating the field's progress.

Kirkwood (1994) identified Comenius, Rousseau, Pestalozzi, Froebel, Herbart, Sheldon, and Dewey (p. 76-78) as having had influence on those recognized as founders of industrial arts and technology education. Anderson (1926) discussed these figures in detail, noting that

> a still later development of this stage of the development of this conception of industrial education is represented in a work by Professors F.G. Bonser and L.C. Mossman of Teachers College entitled *Industrial Arts for Elementary Schools*. ...In this recent move in the field of cultural industrial education history is repeating itself. As reference to the preceding pages will show, the objective study of the industries which it proposes was advocated by Rabelais in the sixteenth, by Comenius in the seventeenth, and by Basedow in the eighteenth century (p. 223-224).

Theorists Regarded as Influential

Anderson's colleague Graves (1910) regarded the earliest of these educators, Rabelais (1495-1553), as a "madcap" whose "works are indecent almost beyond hope of intelligent expurgation" (p. 244), but conceded that Rabelais' theory of education was "more rounded and valuable" than was the education of the day (p. 244) and that his indirect influence upon later theorists, including Rousseau, was certain (p. 246). Anderson's (1926) inclusion of him as among the first to advocate cultural industrial education is based on Rabelais' educational interest in "the industrial occupations as well as in the other features of the everyday life around him" (p. 8). "Rabelais

saw the advantage of approaching the abstract and remote through the concrete and the near at hand" (Bennett, 1926, p. 32).

Comenius (1592-1671) is regarded as one of the most important figures in European education during the seventeenth century. Nelson (1981) noted that the influence of Comenius upon industrial arts has been twofold. First, Comenius advocated education which was practical and objective (i.e., pertaining to objects). In addition, he advocated "cultural" education—a descriptor used by industrial arts educators when referring to the field (p. 24). He is regarded as a primary influence upon the German theorist Basedow (1723-1790), who suggested in 1768 that German "schools be made nonsectarian and that public instruction be placed under a National Council of Education" (Graves, 1924, p. 26). A model school Basedow operated emphasized handicrafts for all students in a curriculum intended to "give some account of man" (p. 29).

Problems in Industrial-Education Historiography

In typical histories of industrial arts and technology education, the progression of the educational ideal of cultural industrial education, exemplified by the works of Basedow, Comenius, and others, is often presented simultaneously with the concurrent history of tool instruction and its historical figures such as Della Vos and Runkle (e.g., Anderson, 1926, p. 155; Nelson, 1981; etc.), perhaps giving the false impression of but one movement.

In fact at least three distinct conceptions of industrial education are often indiscriminately homogenized and presented as the "early history" of the field. One justifies industrial education psychopedagogically, as a teaching method. Pestalozzi and Sheldon are examples of advocates of "object

teaching" (Mossman, 1924, p. 3). Another conception, described in the above quotation from Anderson (1926), is that of cultural industrial education. Students were to learn about their industrial society through genuine industrial activity. As Anderson notes, examples include works by Comenius and Basedow (p. 223-224).

Finally, programs of tool instruction for children and young adults are also included in the history of industrial arts (e.g. Barella & Wright, 1981) and technology education (e.g. Snyder, 1992). Manual-training programs of the late nineteenth century, such as those of Runkle, Woodward, and Adler, have been presented as direct descendants of those of object-teaching or cultural-industrial nature. Although there are undeniably cultural aspects to the curricula of Woodward and Adler, it should be considered that these programs were probably not representative of the times, and that nonetheless both are almost universally regarded as having been based upon a Russian system of tool instruction displayed in the US in 1876 (see Barlow, 1967). Extensions of this logic, such as that "the modern industrial arts programs in the United States have their roots in the manual training movement of the latter part of the nineteenth century" (Lindbeck, 1972, p. 27), or, more vaguely, "the first industrial arts programs in America were known as *manual training* classes" (Scobey, 1968, p. 4), are similarly questionable.

Perhaps rather than a simple and easily-repeated historiographic mistake, this is an indication that there is more than one history of technology education in the US. Whereas today the general-education conception of technology education advocated, for example, by the International Technology Education Association, can claim its theoretical basis directly from the cultural-industrial conception as interpreted by Bonser and Mossman (Foster, 1994), the actual *practice* of the field may in fact be

more closely associated, at least historically, with the distinct movement of manual training—as Lindbeck (1972) suggested.

Historiographic dilemmae are abundant in technology education (Pannabecker, 1987; Petrina & Volk, in press) and a more detailed account thereof is beyond the scope of this paper. Based on the assumption that the history of manual training and its descendants is a part of the history of the practice of technology education, a brief synopsis is presented here.

Industrial-Education Context of the Industrial Arts Movement

Manual Training

Although some of its advocates regarded manual training as a comprehensive subject (see Zuga, 1980) in practice its threefold purpose, at least in the late nineteenth century, was to keep boys in school, "provide vocational skills," and "develop leisure-time interests" (Gerbracht and Babcock, 1969, p. 8). Later, instruction in the basic principles of the processes and materials of industry was added to this list.

As a term, *manual training* "has seemed to mean all good things to certain educational reformers and much evil to others. It has always been subject to a new direction and, like the tariff, always a live subject for discussion when all others, except the weather had been exhausted" (Bennett, 1934, p. 235). To Russell manual training was problematic:

> Woolly sheep have sported with polar bears under fir trees set in a desert of sand. Book-binding and block houses, Indian war bonnets and water wheels, ink wells and Navajo blankets, bent iron jimcracks and raffia baskets, bookshelves and dolls' clothes, broom holders and picture frames—all these and a thousand more mixed up in indiscernible confusion! Is it any wonder that some one should raise the cry of fads and frills? The wonder

is that any one should try to justify such work in school on any ground other than mere recreation" (Russell & Bonser, 1914, p. 4);

It seems unlikely that any two manual training programs operated by different teachers were very similar. Adler's Workingman's School, founded in 1897, is often cited as having possessed an exemplary curriculum (Gerbracht & Babcock, 1969; Snyder, 1992; etc.). The components thereof were tools, machines, and processes. Students were expected to learn the correct use of each of these, as well as to gain an understanding of the need for tasks to be done with them. Eventually, Adler began to integrate other subject areas. "He felt, for example, that aesthetic values and mathematical and physical principles would be better taught by working with material things." (Gerbracht & Babcock, 1969, p. 9). Adler, who specifically assumed that manual training was to be a part of general education, is considered to have been an influence on Woodward (Bennett, 1934), the "father of manual training." Woodward's St. Louis Manual Training School has been frequently treated (Coates, 1923; Zuga, 1980; see also Bawden, 1950). It seems clear that Woodward's program, although heavily influenced by the abstract version of the "Russian system" of manual training was presented in 1876 (Bawden, 1950; cf. Barlow, 1967), eventually evolved beyond tool instruction, into a more cultural study (Bennett, 1934).

Manual Arts

Whichever term modern educators would apply to the curricula of Adler and Woodward, it seems likely that many manual training teachers did not view the subject as particularly cultural; and, to be certain, the term *manual training* eventually was replaced by *manual arts*. Manual arts has been viewed as an upgrade of manual training. "The term [*manual arts*],"

wrote Smith (1981), "is very difficult to isolate and attach to a specific program...it came to represent a revised form of manual training" (p. 185).

It seems as though one major difference between manual arts and manual training was the former's emphasis on the aesthetic. Drawing, for example, was to be taught in both its mechanical and free forms; projects to be constructed were chosen for their aesthetic as well as practical values. Descriptions of manual training and manual arts in histories of industrial arts (e.g. Martin & Luetkemeyer, 1979; Smith, 1981; Snyder, 1992) are frequently separated by descriptions of the Sloyd movement, which sought to introduce educational handicrafts into the schools. Other movements, such as the apparently distinct Arts and Crafts (or *Arts and Craft*) have tended to add further confusion to the lineage of manual arts.

Bennett (1907) regarded this straightforwardly: "drawing and manual training have...been growing nearer and nearer together, and in their best development they have now become so unified that they are properly designated by the single term Manual Arts" (p. 189).

Whereas manual training was not consistently presented as a general-education subject, manual arts was almost always so:

> Technical manual arts, like any other subject given for general educational purposes, will justify itself in proportion as it can show (1) Similarity of subject matter considered in school to that which the individual will meet in life after leaving school; (2) similarity of method of procedure; (3) the giving of ability to pupils to generalize their specific experiences and see them in the light of "larger principles" (Griffith, 1916, p. 5).

Generalizations Regarding the Manual Subjects

The brief treatment here of manual training and manual arts is meant more to describe the atmosphere in of manual and industrial education in

the early twentieth century than to describe the lineage of present-day technology education. In fact, technology education, founded as *industrial arts*, may be regarded as a reaction to the prevailing conception manual subjects—not a descendant thereof. In practice, that prevailing conception only very slowly gravitated toward the ideals of industrial arts; in theory, however, it has advocated them wholeheartedly. As noted above, the industrial arts movement was surely not the first attempt at social or cultural education. Yet "unquestionably industrial arts never has been part of the manual training tradition" (Brown, 1977, p. 3).

In 1907, Bennett contrasted a growing "industrial education" movement in the schools, which was "cultural by virtue of being highly vocational," with manual arts, which he defined as "work that is cultural first and then vocational" (p. 190). He recommended that the manual arts profession, which he regarded as differing only in emphasis from vocational industrial education, make specific and deliberate adjustments so as to meet more vocational demands (p. 193-195).

Bennett's article was published while influential leaders in industrial education, such as Richards and Prosser, were helping draft federal legislation to recognize and fund vocational education. In 1917 Woodrow Wilson signed the Smith-Hughes Act, which initially provided $1.86 million in funding for vocational programs in public schools. As Snyder (1992) noted,

> There were now two similar, yet distinctly different, forms of industrial education provided for by the American public educational system. Traditional general education programs, whether they were called manual training or industrial arts, were now in company with the new vocational education program (p. 96).

This legislation was enacted in what was probably the middle of the development of a new conception of industrial arts at Teachers College,

Columbia University. Teachers College faculty members Bonser and Mossman (1923) were still using the term "manual training" to identify the prevailing interpretation of industrial education in the 1920s. In *Industrial Arts for Elementary Schools* they listed the components of manual training to which they objected:

> Investigation of the courses proposed and taught in our schools leads one to note these prominent inadequacies in manual training:
>
> Want of relationship of the work to life. The sequence of the models was in terms of tool processes.
>
> Failure to provide for the individuality of the child. Each must conform to the system.
>
> Lack of motivation. The work was all prescribed in a fixed course.
>
> Placing the emphasis upon the product as the objective, rather than upon the growth of the child (p. 479).

Bonser and Mossman, along with Russell and many others never considered in the histories of industrial arts, developed a comprehensive system of industrial education which, although never implemented on a large scale, has been the theoretical basis for technology education for most of the past seventy years.

THE INTENT OF INDUSTRIAL ARTS

When Lois Coffey Mossman (1877-1944) is mentioned at all in the history of industrial arts, it is only very rarely without industrial arts folk hero Frederick Gordon Bonser; she is known in the technology education profession almost exclusively for her work with Bonser in their aforementioned *Industrial Arts for Elementary Schools* (1923).

Much like current technology-education curricula which are composed of content organizers such as manufacturing, communication, and the like, Mossman's organization of the study of industry included several content areas. But hers were a bit different: foods, clothing, shelter, records of human experiences, containers, and tools and machines (e.g. Mossman, 1938, p. 328; Bonser & Mossman, 1923).

It is clear from her earlier work that Mossman regarded industrial arts as a distinct curricular area in the public schools (Coffey, 1909a, 1909b; Mossman, 1921). During the early 1920s, like Bonser, she viewed the practical subjects as a single entity—at least in the elementary grades.

But ultimately, she ceased to regard any arrangement of practical subjects as a separate part of the curriculum, instead including studies of industry as a part of the social studies (Mossman, 1929b, 1938). In fact, she ceased using the term "industrial arts" altogether (see Mossman, 1927, 1929a). It bears mention that in her major book concerning the elementary school curriculum, Mossman (1938) considered industrial arts an integrated part of the social studies curriculum.

Therein she specified that social industrial arts subject matter was best learned through constructive activities: "genuine participation in the processes of making the products may develop respect for work and for man's

inventive achievement" (1938, p. 60)—although she cautioned that construction should not be used when more sensible methods were available (Mossman, 1927).

Who was Lois Mossman?

Because, short of her obituary, no biography of Lois Coffey Mossman seems to exist[5], a brief recounting of her life is in order. Most of the following biographic information about Mossman has been gleaned from birth, marriage, census, and employment and records.

Anna Coffey, called "Lois" most or all of her life, was born October 13, 1877, to Adolphus and Susan Francis (Frances?) Coffey, in Newark, Indiana, a tiny village in Beech Creek Township, where her father was probably a minister. Her family appears to have moved west shortly after she was born. By 1895 she was living and teaching in Kansas. She later received a state elementary diploma from the State Normal School in Emporia, and continued to teach in Kansas until 1902, when she was named principal of the Las Vegas, New Mexico, High School.

Four years later she accepted the position of critic teacher at the Western State Normal School's training school in Macomb, IL. It was likely there that she first met Frederick Gordon Bonser, also new to the school. For the next twenty-six years Mossman and Bonser were always at the same university.

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[5]To the author's knowledge. It should be noted that Miller and Smalley's *Selected Readings for Industrial Arts* (McKnight & McKnight, 1963) contained a 76-word account of her life and works.

There are far too many instances of industrial arts and technology education historians incorrectly referring to Mossman's work to mention here. Bawden (1950), Miller and Smalley (1964), Smith (1981) and Foster (1993) are among at least dozens to refer to the Bonser and Mossman definition of *industrial arts*as though it were Bonser's. Gerbact and Babcock (1969) and Lux (1981) were not the only historians to have actually cited Bonser alone when quoting the definition verbatim; Clark (1989) made reference to "Bonser, et al." (p. 14).

Generally, however, it is not Mossman's contributions to a particular work which are ignored; it is Mossman herself who is ignored in histories of the field. Interestingly, Sredl (1964) refered repeatedly to Mossman. However, without exception he referred to her as "*Louis* C. Mossman" (e.g. p. 64, 136, 307).

Other Well-Known Historical Figures

Kirkwood, Foster, and Bartow (1994) surveyed leading technology teacher educators in 1993 in an effort to determine which historical (industrial arts) leaders were recognized as most influential on present-day technology education philosophy. Findings indicated that among leaders active in the first quarter of the present century, Dewey and Bonser were clearly the most influential, together receiving nearly three-quarters of all nominations in the study. Interestingly, Bonser "himself wrote [that] he has 'always been an ardent advocate of the philosophy of Professor John Dewey'" (Mossman, 1931, p. 5).

Other Teachers College faculty considered influential were Mossman, Russell, and William Heard Kilpatrick. Just as Bonser claimed influence from Dewey, Bonser and Mossman acknowledged Russell's impact on their philosophy (Bonser & Mossman, 1923, p. viii), and Mossman repeatedly

noted her "indebtedness" to Kilpatrick (Mossman, 1924; 1938). In fact, those responsible for what Towers, Lux, and Ray (1966) called the "Dewey-Richards-Bonser thought" (p. 166) accounted for 90% of the 1993 votes in the study.

Bonser and a New Manual Subject

Aaron Bonser migrated to Illinois with his relatives in a covered wagon sometime after the US Civil War. Frederick, his first son, was born in a log cabin on June 14, 1875. In response to "there being no high school near his home," Frederick went to live with an uncle 160 miles away, where he completed the full four years of high school in two years (Bawden, 1950, p. 27-28).

After graduating from high school in 1895, he immediately enrolled in the University of Illinois. But two years into the course of his bachelor's degree, he left to teach at a nearby rural school for a year. His health dictated a move to another uncle's home near Walla Walla, Washington, where he worked as a farm laborer, and later, in improved health, as a teacher at two schools in Washington (Phipps, 1935). He finally returned to the University of Illinois in 1899, and after two more years of study there, received a bachelor of science with a major in psychology in 1901. He was immediately awarded a fellowship in psychology, and completed his master's degree the following year (Luetkemeyer and McPherson, 1975, p. 260).

Bonser served as professor of education at the State Normal School in Cheney, Washington (Mossman, 1931, p. 2) and professor of education and director of the training school at Western Illinois State Normal School (Luetkemeyer and McPherson, 1975, p. 260). It was there, in Macomb, Illinois, that he met Mossman and began his work in industrial arts education.

In 1910, Bonser made his final major career move, returning to Teacher's College as professor of education. That year he completed his dissertation and earned his doctorate (Mossman, 1931, p. 3). Chief among his several major works on industrial arts pedagogy was *Industrial Arts for Elementary Schools*, a book he co-authored with Mossman. Probably the most significant book in the history of industrial arts and technology education (see Brown, 1977), it will be discussed later in more detail. After the publication of *Industrial Arts for Elementary Schools* in 1923, Bonser continued to write on the topics of elementary and secondary education, industrial arts, home economics, and the like (Luetkemeyer and McPherson, 1975, p. 261). He died on June 8, 1931, a week before his 56th birthday, after an illness of four months (Mossman, 1931, p. 1).

Lois Mossman began her remembrance of Bonser on page one of the October, 1931 *Teachers College Record*, "The friend of students and children, Frederick Gordon Bonser, is dead."

Later, a memorial service for Bonser was held at Teachers College. "According to Dr. Milton C. Del Manzo, Provost of Teachers College, the memorial services were held during the summer because at this time many school teachers from all parts of the country who knew Dr. Bonser are at Columbia" ("In Memory of Dr. Bonser," 1931, p. 21).

Russell and the "Social-Industrial Theory"

Bonser was hired at Teachers College in 1910 by Dean James Russell, whom Bonser and Mossman (1923) acknowledged for "much of the underlying philosophy" of their work (p. viii). Many other historians of industrial arts (e.g. Bawden, 1950; Hoots, 1974; Martin & Luetkemeyer, 1979)

have suggested that Russell's influence on the development of general-education industrial arts was significant.

Russell's major work in the field of industrial education was "The School and Industrial Life" (n.d.) which appeared with Bonser's "Fundamental Values in Industrial Education" (1910), in the Teachers Publication *Industrial Education*. Snedden and Warner (1927) termed the Russell-Bonser philosophy "The Industrial Social Theory" (McPherson, 1972). It is regarded as having done "much to revolutionize the industrial arts" (Stombaugh, 1936, p. 129).

Just as Mossman is often ignored when her jointly-authored work with Bonser is considered, so is has Bonser's role in crafting the industrial-social theory been treated lightly. Smith (1981) referred to Russell's plan as "revolutionary" (p. 196); Lewis (1994) wrote that it "set curricular boundaries for the subject [industrial arts]" (p. 15).

Sredl (1964) suggested that Bonser "expounded" on Russell's theories (p. 47). This interpretation seems corroborated by Russell himself (1931). However, in biographing Bonser, McPherson shed considerable doubt on the

suggestion made by some industrial arts historians that both Russell's and Bonser's contributions to *Industrial Education* originated with Russell alone.[6]

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[6]Russell described the development of the two papers when he eulogized Bonser in 1931. He carefully described how he, long before Bonser was appointed at Teachers College, he had developed the theory outlined in the publication himself. Once the philosophy was published and disseminated, it needed to be put into practice. "And there," he said, "is where Professor Bonser came into the picture" (1931, p. 11). Russell reminded the audience that Bonser did not finish his paper until 1912. In short, Russell did not credit Bonser with any of the ideas in "The School and Industrial Life." Apparently, this statement, taken with several other factors, have caused some historians (e.g., Sredl, 1964; Martin & Luetkemeyer, 1979) to assume that Bonser's paper was a reworking of Russell's. These include the similarities between the two articles and the fact that Russell's paper appeared before Bonser's. But as McPherson (1972) pointed out, the ideas in Russell's papers had existed in Bonser's writings since at least 1904—the year Russell claimed to have begun devising his theory. Bonser had been enrolled at Teachers College as a student in 1905-06 (Phipps, 1935); and as previously mentioned, Russell travelled to Macomb, Illinois (about 900 miles from New York City) to visit Bonser sometime during the latter's tenure there, from 1906-1910. But a letter (on file at Teachers College) from Edwin Dexter (1902) of the University of Illinois at Urbana to Russell suggests that Bonser and Russell met in the summer of 1901.

McPherson's 1972 biography of Bonser (esp. pp. 175-177) demonstrates convincingly that "The School and Industrial Life" essentially contained Bonser's philosophy. Finally, it should be suggested that what is referred to as "Bonser's philosophy" would probably be more accurately be referred to as "the Macomb philosophy" or "Bonser and Mossman's philosophy."

In fact, there is reason to suspect that Mossman may have been the originator of many of the ideas underlying the theory.

Russell began *The School and Industrial Life* with an overview of the school curriculum and its problems. He identified two prevailing classifications of school subjects: humanistic (language, art, etc.) and scientific (math, science, etc.). He suggested adding to these a third group—"economic studies...to provide instruction in the industries"(Russell & Bonser, 1914, p. 6). In part, the economic studies would replace manual training which Russell regarded "in fact...little more than applied design" (p. 4).

As Toepfer (1966) indicated, parts of Russell's contributions to the industrial-social theory were based on Dewey's 1900 book *The School and Society*; Fisher (1967) made similar suggestions regarding Bonser's contribution, which was "very similar" to Russell's (Stombaugh, 1936, p. 129). Bonser's vision of this new portion of the curriculum involved replacing "drawing, manual training, domestic science, and domestic art" with a subject which would "include the really most vital and fundamental values in all of these. It is also offered that this subject will ... [develop] a knowledge and understanding of social and economic relationships essential to every child (p. 29).

It is important to note that throughout *Fundamental values in industrial education*, Bonser emphasized that industrial studies in general education should be *social* studies.

Most recent histories regarded *Fundamental values* as one of the most significant publications in the field and its dissemination as a defining event in its history (e.g. Olson, 1963; Miller, 1979; Smith, 1981); however, the field has been slow to react to its suggestions (Bawden, 1950; Smith, 1981).

Other Individuals at Teachers College

Bonser and Russell each taught in public schools for a few years before they began to prepare teachers at universities; Mossman taught for several years, eventually serving as a public school principal, before beginning her career in higher education. Still, the stereotype of professors of education producing detached, highly theoretical curricula and program schemes may have applied to all three. But that their ideas were never widely implemented cannot be explained entirely by a lack of sympathy with inservice teachers. Several teachers associated with Columbia University's Teachers College and its laboratory schools at the time elucidated the Mossman-Bonser-Russell conception of industrial arts.

In their *Social and Industrial Studies for the Elementary Grades*, Jane Welling and Charlotte Calkins (1923) provided readers with methods of implementing the subject. The book contained more than 300 pages explicating the teaching of the industrial arts—food, clothing, shelter, implements, and records—organized in three classifications: social life and the family, modern and historic background, and problems of modern life. Welling and Calkins considered Bonser and Sara Patrick, an instructor at Teachers College, their inspiration for the book.

Clara Stilmar's (1912) fifth-grade industrial-arts plan for the College's Speyer laboratory school was one of many published under Bonser's direction of the school. And Stilmar, Welling and Calkins were not alone. Alice Krackowizer (1919) and Margaret Wells (1921) wrote similar books, discussing in detail the need for industrial arts activities to have a social perspective. Later, Theresa Gunther (1931) performed empirical research to substantiate Bonser and Mossman's claims that to be effective, industrial arts should be manipulative.

While Bonser and Mossman were teaching courses which did not relate specifically to industrial arts, or to the elementary school, "the courses to prepare teachers for this type of work [industrial arts as a social study] at the elementary level were continued at Teachers College by Sara Patrick" (Wygant, 1959, p. 222). Patrick was a full-time instructor of industrial arts education for 25 years at Teachers College, in all teaching many more elémentary industrial arts courses than Bonser and Mossman combined. Like Bonser and Mossman, she viewed industrial arts as part of the "social studies" (Welling & Calkins, 1923, p. viii; see also Patrick, 1916).

In 1924 Patrick founded the Industrial Arts Cooperative, which provided thousands of teachers with industrial and fine arts ideas over several decades. It was the first teacher's cooperative in the United States (Foster, in press).

Evolution of Industrial Arts Since the 1930s

Bonser and Mossman's definition of industrial arts[7]—"a study of the changes made by man in the forms of materials to increase their values, and

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[7]According to Luetkemeyer and McPherson, the origin of this definition may be found in Bonser's writings of the 1913 or earlier (1975, p. 262). "I remember hearing the point of view," Bawden wrote, "if not this precise definition, discussed in class when I was a graduate student at Columbia University in 1912-1914" (1950, p. 38). Bawden advanced that the true origin of the definition may be found in Bonser's 1910 paper *Fundamental Values in Education*, later republished with an essay by Russell as *Industrial Education* in 1914. However, the definition may have been conceived by Bonser and Mossman in 1908 or 1909 after McMurry came to Macomb and apparently used the term "changes in the forms of materials." Mossman noted this wording when describing

[note continued]

of the problems of life related to these changes" (1923, p. 5)—is "readily recognized as the first formal definition of industrial arts to appear in print. In fact, it can be said that is the only definition of industrial arts rendered thus far because most, if not all, industrial arts definitions are simply a variation of the original" (Brown, 1977, p. 2) "Most who have studied the history of industrial arts, at one time or another, have been required to memorize" it (Hoots, 1974, p. 223).

The definition has three major elements: education ("a study of"); technology ("the changes made by man in the forms of materials to increase their values"); and society ("and of the problems of life related to these changes")—components which would comprise later definitions of the subject.

Definitions of "Industrial Arts"

In 1937, Mossman was among eleven educators commissioned by the US government to issue a publication concerning industrial arts in American schools. They defined *industrial arts* as "a phase of general education that concerns itself with the materials, processes, and products of manufacture, and with the contribution of those engaged in industry" (US Department of the Interior, 1937, p. 1). Roy G. Fales, Mossman's co-worker on the government project, advanced this definition of *industrial arts* a few years later: "the broad study of the materials, organization, tools, processes, products, jobs, and human problems of industry" (1940, p. 3).

McMurry's address in the school's weekly newspaper.

Wilber, 1948

Perhaps the next prominent definition of *industrial arts* after Bonser and Mossman's appeared in 1948 in Gordon Wilber's well-known text *Industrial Arts in General Education*. Martin and Luetkemeyer (1979) credited Wilber with considerable influence in the field after World War II. Calling it the "basic text for professional courses in industrial arts teacher education" and "famous," they wrote that *Industrial Arts in General Education* was "used by colleges throughout the country" (p. 35).

Wilber's (1948) definition, which he suggested was based on Bonser and Mossman's (1923) and Fales' (1940), read "those phases of general education which deal with industry — its organization, materials, occupations, processes, and products — and with the problems of life resulting from the industrial and technological nature of society" (p. 2). Conceptually, this definition was quite similar to Bonser and Mossman's, but substituted the concept of industry for technology.

In the period following the publication of Wilber's book, Maley was one of the most influential leaders in the profession (Bartow, 1983; Wright, 1992). His 1973 *Maryland Plan* definition of *industrial arts* was nearly identical to Wilber's, save his addition of the concept of "technology:" "those phases of general education which deal with technology, its evolution, utilization, and significance; with industry, its organization, materials, occupations, processes, and products; and with the problems and benefits resulting from the technological nature of society" (p. 2).

Jackson's Mill, 1981

One of the most significant curricula in the history of industrial arts was the *Jackson's Mill Industrial Arts Curriculum Theory* project of 1981

(Householder, 1989; Wright, 1992). Its definition of *industrial arts* was very similar to Wilber's and Maley's: "a comprehensive educational program concerned with technology, its evolution, utilization, and significance; with industry, its organization, personnel, systems, techniques, resources, and products; and their social/cultural impact" (Snyder and Hales, n.d., p. 1).

Historical Figures in Industrial Arts Since the 1930s

Kirkwood, Foster, and Bartow (1994) identified three major leaders in developing the philosophy of what would become technology education during the time period 1917-1985. They were William E. Warner of the Ohio State University, a student of Bonser; Donald Maley of the University of Maryland; and Paul W. DeVore of West Virginia University. A brief discussion of the professional lives and the contributions of each is in order.

William E. Warner (1897-1971)

Based on the accounts of the Warner's life by Latimer (1981) and others, Speaker (1992) speculated that the comprehensive transition of the profession of industrial arts to technology education might have begun decades earlier, and might have been completed much more quickly and efficiently, had William Everett Warner simply been more personable.

Warner studied under Bonser at Columbia, where he earned his doctoral degree. His advocacies of the general shop theory and of approaching the field of industrial arts analytically are evidence of Bonser's impression upon him, and although these were important components of his plans to "reflect technology" in industrial arts, his creativity is also in evidence in his works.

Although the *Terminological Investigation* (Warner, Bollinger & Hutchinson, 1932), which analyzed the names shop teachers used to identify their work, is often identified as one of Warner's most cogitative efforts, his 1947 opus *A Curriculum to Reflect Technology* (Warner, 1947) stands alone as his most important work (Speaker, 1992). To assume, as suggested above, that the field's transition to technology would have benefited greatly had Warner's disposition been different seems to necessitate the assumption that Warner had a comprehensive plan for technology in industrial arts. *A Curriculum to Reflect Technology* was that plan. But apparently Warner's difficulty with resistance to his plan simply made him more unpopular, until finally his disposition was so negative that others in the profession found him difficult to deal with. (Evans, 1979, p. 416; Evans, 1988; Latimer, 1981).

His proponents saw the situation a bit differently. "It (*A Curriculum to Reflect Technology*) was too far ahead of the times to gain general acceptance," insisted Delmar W. Olson, a student of Warner's who became prominent in his own right, "but like all advanced thinking it has had its impact on the profession" (1963, p. 15)

Warner's best-known service to the field was his establishment of two organizations which have independently increased the profession's stature. Warner is credited with founding the American Industrial Arts Association (now the International Technology Education Association) in 1939 (Brown, 1981), an organization intended to give the profession a much-needed forum for the transmission of knowledge about industrial arts.

The association was established at the tenth anniversary of another organization founded by Warner, the educational honorary *Epsilon Pi Tau* (EPT). Apparently the establishment of the AIAA was not on the agenda of the EPT's two-day conference, but "the program was suddenly altered from its

original agenda and, by the end of the conference, the result was the newly-organized American Industrial Arts Association, complete with elected officers and a draft of a constitution" (Snyder, 1992, p. 104).

Ironically, in 1950 the AIAA's constitution was amended to curtail Warner's control over the organization. But the year before Warner's death, he was lauded at the AIAA for his "contributions to the field of Industrial Arts, for his lifetime dedication, and for organizing the AIAA" (Speaker, 1992, p. 13). According to Delmar Olson, one of Warner's premier students,

> This was the one and only time that Warner was known to emotionally express his appreciation publicly for a recognition on his behalf. In the past twenty years he had bitterly opposed many of the policies of the Association, only to be ignored. Apparently the realization that after all the years his contributions to the organization were appreciated, was enough to bring tears down his cheeks that seemed to choke his response. Frequent remarks were overheard to the effect that Warner was human after all (quoted in Latimer, 1981, p. 205).

Donald Maley (1918-1993).

In an educational field which during the 1950s, 60s, and 70s saw teacher whims and fancies often dictating content in junior and senior high schools, Maley's child-centered philosophy of general education and his advocacies of subject-matter contexts such as anthropology and technology challenged the field to view itself as a justifiable and vital part of general education, rather than simply perpetuate its conventional role as avocational at best—and a place to send problem students at worst.

The association between Maley and Warner is a bit less than direct than is Warner's to Bonser. Maley studied under R. Lee Hornbake, who in turn

studied under Warner. One can see equally strong evidence of the influence of both Bonser and Warner on Maley's philosophy of industrial arts.

Maley's professional life was in many ways dedicated to a single, unifying curriculum project which was dubbed "the Maryland Plan" by some of his associates. The name stuck, and today it remains as one of the best-known and most-respected industrial arts curricula. Although preempted by 1981's *Jackson's Mill* (Snyder & Hales, n.d.) and 1990's *A Conceptual Framework* (Savage & Sterry, 1991), many of the curricular bases of the Maryland Plan are evident in contemporary curricula.

Although Maley's book *The Maryland Plan* was published in 1973, the plan itself was incepted in 1947, the same year that Warner's *Curriculum to Reflect Technology* was presented to the AIAA. It was implemented and refined over the next quarter-century before Maley felt it was ready for publication. Central to the curriculum, said Maley, were "broad beliefs" about education and about the industrial arts. "The schools have as a primary function the development of people" (Maley, 1979) This child-centered approach may be attributed to Bonser's influence on Warner.

The effect of the Maryland Plan on teacher educators has been widespread. As Maley detailed in that article, a number of resource publications and films have been made which illustrate components of the Maryland plan. In addition, the three doctoral dissertations mentioned by Maley (Maley, 1979) as being related to the plan demonstrate that, like Bonser and Warner, Maley himself has left a considerable legacy in the field of industrial arts.

Maley's death was considered to be the "end of an era" by Starkweather (1993, p. 35), but Waetjen (1993) implied that Maley's philosophy has continued to be advanced, especially by Starkweather.

Paul W. DeVore (1926-)

As US Senator John D. "Jay" Rockefeller IV of West Virginia noted, DeVore has been "recognized around the world as an authority on technology education" (*Technology Education Act*, 1986). He is probably best remembered for his content structure for technology (Kasprzyk, 1973; Custer, 1991); conceptualizing technology as an "intellectual discipline" (Lauda & McCrory, 1986); and advocating the establishment of technology as the content base for industrial arts (Wright, 1992). The latter assessment seems generally accurate, although the role of Olson—a teacher of DeVore (Snyder, 1992)—in the process of establishing technology as a content base for industrial arts has probably been underestimated (see Horton, 1985).

There is currently little biographical data available concerning DeVore (Foster, 1992). He taught in public schools for three years, spending most of the rest of his career in higher education in Ohio, New York, and West Virginia. He was appointed in 1967 to West Virginia University's Industrial Arts faculty (Pollock and Bunten, 1969) while the department was in the midst of its content conversion from an industrial to a technological base.

One of DeVore's primary concerns was the interrelatedness of technology education and the maintenance of democracy (e.g. DeVore, 1966; 1991). In a 1967 paper presented at the American Industrial Arts Association convention in Philadelphia, he announced that "(i)n today's world, when there is a greater need than ever before for technological literacy, we discover that contemporary status of the industrial arts to be one of confusion, and perhaps indecision..." (DeVore, 1967, p.).

As early as 1972, DeVore was investigating the possibility of a federal Technology Education Act. As the president of the American Industrial Arts

Association, he proposed that, in light of his observation that "the Association initiate action to design model legislation for consideration in the Congress of the United States to create a Technology Education Act..." (DeVore, 1973). Similarly, many of DeVore's (e.g. 1971, 1972, 1991) writings demonstrated a concern for the future.

As DeVore's interest in the future was drawn from his concern for technological literacy, so was his concern for the youth who are to be taught by educators a result of his concern for the future. "I think the essential element, as we encounter this problem (of converting from an industry-based knowledge area to a technologically-based one) is to examine...the contributions this area of study can make to the education of youth" (*Proceedings*, 1969; see also DeVore and McCrory, 1975)

DeVore warned that current trends toward a technological illiteracy—which he noted would lead to the control of society by a "technical elite—" would only result in a continuance of the course toward a social dichotomy between the "haves" and the "have-nots." (e.g. *Technology Education Act*, 1987)

"There is only one answer," he wrote: "change the teacher education programs. Radical surgery is needed including consideration of the elimination of student teaching which in most programs is detrimental to change because students intern in traditional programs where out-of-date content and programs exist." (*An Interview*, 1980).

Industrial Arts Curriculum Project (IACP)

While DeVore was regarded as the foremost advocate and developer of the conception of pure technology as the content base for industrial arts (Wright, 1992); many others regarded industry and/or the trades as the basis

of industrial arts (e.g. Hostetler, 1960; see also Wright, 1982; Feirer, 1985). According to Snyder (1992), Lux and Ray "led the majority of industrial arts professionals who followed the more industry-based approach" (p. 175). Their Industrial Arts Curriculum Project was an "industry-centered approach" (Householder, 1972, p. 13; see Wright, 1992) which was adopted widely (Frantz, 1982, p. 133).

Donald G. Lux (1924-), who received his undergraduate education at the Stout Institute in Menomonie, Wisconsin, taught for a decade at the University of Illinois until being named Chair and Professor of Industrial Arts at the Ohio State University in 1965. His early advocacy of problem-solving in industrial arts (1959) began 25 years of leadership in the field. He retired in 1984.

Willis Eugene Ray (1929-) also taught at the University of Illinois and the Ohio State University. He was hired at Ohio after teaching in the public schools for five years. The president of AIAA during the 1978-1979 school year, Ray began the current system of rotating AIAA presidency among teacher educators, supervisors, teachers (Snyder, 1992, p. 107). Edward Roy Towers (1927-), Lux, and Ray issued in 1966 *A Rationale and Structure for Industrial Arts Subject Matter*, a lengthy work which served as the basis for the Industrial Arts Curriculum Project, originally a "joint effort of The Ohio State University and the University of Illinois, with support from the United States Office of Education" (Towers, Lux & Ray, 1966, p. iii) to develop industrial arts curriculum materials.

Lux (1979) suggested that with the exception of University of Illinois staffer Jacob Stern, those responsible for the major work of the project were from the Ohio State University; educators at Illinois "provided advice and encouragement...The project was headquartered at OSU, funded by the United

States Office of Education (USOE), and administered by the OSU Research Foundation (OSURF). Staff at the U of I and numerous public school systems *assisted* with the research..." (p. 149; emphasis added). The partnership between Illinois and Ohio, he admitted, "never adequately worked out" (p. 154).

TECHNOLOGY EDUCATION—HISTORICAL CONSIDERATIONS

In 1985 the American Industrial Arts Association issued this definition of technology education:

> (a) comprehensive, action-based educational program concerned with technical means, their evolution, utilization, and significance; with industry, its organization, personnel systems, techniques, resources, and products; and their sociocultural impacts (1985, p. 25).

This definition of "technology education" is nearly identical to the definition of "industrial arts" in the Jackson's Mill document ("a comprehensive educational program concerned with technology, its evolution, utilization, and significance; with industry, its organization, personnel, systems, techniques, resources, and products; and their social/cultural impact" (Snyder and Hales, n.d., p. 1)). While Pullias (1989) and others found technology education and industrial arts to be "drastically different" in both content and method (p. 4), the strong implication of these definitions is that, at least in the early 1980s, there was no difference.[8]

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[8]It should be considered that at the time technology education may not have been well-defined—this was its prime weakness, claimed Swanson (1981, 1983; cf. Lauda, 1982). By the 1990s it became clear that "technology education" was intended to mean more than "hi-tech" industrial arts (Hayden, 1991; Pullias, 1992). But Starkweather's pledge to "help outstanding industrial arts 'shop teachers' become progressive 'technology teachers' with the ability and foresight to explore computers, robotics, space transportation..." (1983b, p. 2) suggests that either the conception of technology education of the AIAA Board of Directors at the time was as "high technology" industrial arts (see Zuga & Bjorkquist, 1989)—or that the upcoming blow of a name change was being softened a few years before it was to take place.

In addition to its close similarity to the Jackson's Mill definition, the AIAA's is a definition that does not vary greatly from Bonser and Mossman's (1923): "a study of the changes in the forms of materials made by man to increase their values, and of the problems of life related to those changes" (p. 5). The two definitions essentially emphasize the same points in the same order. Thus, historically, the most prominent definitions of industrial arts and technology education have essentially been the same (see Foster, 1994).[9]

The Name Change of 1985

Determining who first used the term "technology education" as a replacement for "industrial arts" will probably occupy historians the same way the first use of "industrial arts" has. Certainly the term "technology" had been used to denote segments of the content of industrial arts since at least 1915,[10] and was later used by Warner in the 1940s, Olson in the 1950s, and Scobey in the 1960s to identify the field's content base. In the US, the term

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[9] Wright, Israel and Lauda's 1993 definition for technology education, published by the ITEA, reads as follows. Technology education, they wrote, is "an educational program that helps people develop an understanding and competence in designing, producing, and using technology products and systems and in assessing the appropriateness of technological actions" (p. 4). It contains all of the elements and much of the phrasing of the AIAA (1985) definition, but in phrasing revisits Bonser and Mossman's education–technology–society formula, eliminating the concept of industry.

[10] e.g. in Bonser's (1926) history of industrial arts at Teachers College, Columbia University, he mentions courses with titles such as "The Technology of Metalworking" being offered as early as 1915.

"technology education" was in use by the late 1960s (*Proceedings*, 1969; Lauda, 1984); this may have been preceded by programs in Europe (Gradwell, 1988).

As AIAA president, DeVore suggested in 1973 that the name of the association be changed to the "American Technology Education Association" (p. 484); by the late 1970s, some he and Lauda were suggesting that the name of the profession be changed "to technology education to reflect cultural reality" (DeVore & Lauda, 1976, 145).

- By the early 1980s, the profession of industrial arts was seriously contemplating a name change—although not necessarily to *technology education*. The results of Starkweather's (1975) dissertation indicated that in the time period 1975-1984, 20% of public-school industrial arts students would be affected by a name change in the field. Starkweather assumed the executive directorship of the American Industrial Arts Association, and by 1984 a name change for the organization was in motion. The new name of the organization, International Technology Education Association, was made official early the following year (Streichler, 1985).

Objections to Changing the Name of Industrial Arts.

The move to change the name of the profession was made despite the thoughtful objections of some of the foremost thinkers in the field, including several at the University of Maryland, where Starkweather had been employed for several years before being hired by the AIAA. For example, Herschbach (1984) warned that the field's adoption of a broad study of technology would lead practitioners to "stray into highly complex and sophisticated fields of scholarship and inquiry, often selecting partial facts and perceptions of technology to apply in school laboratories in a very limited way" (p. 31). Maryland professor Luetkemeyer (1984) noted that by definition,

a true study of technology would be theoretical and be classroom-based, not laboratory-based. The name-change movement, he wrote, "with all its implications raises serious historical and philosophical questions. Further study and more serious thought is needed" (p. 25).

"Thank goodness most of the global rhetoric about technology among industrial education personnel," wrote Bjorkquist and Swanson in 1981, "is largely ignored by these same persons when they implement curriculum" (p. 14). In advocating industry as the content base for industrial arts, Wright (1982) noted that the human activities from which industry-based industrial arts draws its content were being characterized by some educators as "technological literacy" (p. 2). "This characterization," he opined, "far misses the mark" (p. 2).

It should be noted that most of those who urged the profession to carefully consider the name change were *not* simply opposed to change. In fact, they were largely in favor of progress in the field. Suggestions for advancing the field included teaching the industrial sciences (Lange & Hayes, 1981), industrial technology (e.g. Wright, 1985), aligning more closely with vocational education (Good & Good, 1981), and the like. At least two rationales for opposition to recasting industrial arts as "technology education" during the early 1980s are evident in the literature. One, explicated by Swanson (e.g. 1984), is that for certain philosophical reasons, a move to technology education was *problematic per se*. "Technology is bigger than any one field of study and it is presumptuous to think that industrial education can lead or reflect technology beyond some very limited view" (Bjorkquist & Swanson, 1981, p. 14). The objections of this group of writers related primarily to the proposed content change for industrial arts—not to a name change.

The other school of opposition, exemplified by Lux (1983), also acknowledged the need for change, but doubted that changing the field's name would be productive. Lux and his Ohio State University colleague Blankenbaker (1984) suggested that the word *industrial* remain as part of the name of the profession. Like Wright (e.g. 1985), they favored a refocusing the content of industrial arts on industrial technology—as opposed to broadening the scope of the field in a change to "technology education."

In an well-known address before the 1985 Technology Symposium delegates in California, PA, Feirer announced that he was "here to defend the proposition that we continue to call our program *industrial arts*" (p. 16). He suggested that by changing its focus to technology education, industrial arts would risk loosing its identity as a hands-on subject (p. 17), that true technology teachers would be difficult to prepare (p. 18), that no one school subject could claim technology (p. 19), and technology education would become content-centered, not student-centered (p. 20).

Perhaps Feirer was right. The field's content has yet to be determined (e.g. Wright, 1992, 1993); teacher preparation rate has sharply decreased in the recent past and has been viewed as a serious threat to the field's vitality (Volk, 1993a); and the proliferation of modular technology has caused some to warn that technology education has become content-centered, not student-centered (e.g. Petrina, 1994).

But by the time Feirer delivered his speech, the American Industrial Arts Association had already changed its name. In retrospect, it appears the name change was sure to happen despite the opposition.

The Mechanics of the Name Change.

When the school year 1979-1980 ended, three individuals were listed on the masthead of *Man/Science/Technology* as AIAA staff. Donald Rathbun was executive director of the AIAA, Marilyn Sharkey was the association's director of publications, and Sally Scrimgeour was the advertising manager. The association's journal did not have an identified executive editor (AIAA, 1980). By the time school was back in session in September, Rathbun, Sharkey, and Scrimgeour were gone.

"Dr. Kendall N. Starkweather, executive director,...was appointed during the summer by the executive board," AIAA President Les Litherland (1980, p. 2) reported in September. Litherland went on to note that new directors of professional services and publications and advertising, as well as a new coordinator of finances, were named during the summer. Starkweather also became editor-in-chief of the AIAA's journal.

Soon the term "technology" began to appear with increasing frequency in the journal. Simultaneously the terms "industrial arts," "vocational," and "shop" were seen less frequently, as was the full name of the American Industrial Arts Association (it was more frequently abbreviated to "AIAA"). In March 1981, for example, *Man/Science/Technology* called for project ideas which "incorporated technological concepts into hands-on activities" (AIAA, 1981b). The acceptable program areas included communications, construction, manufacturing, and transportation. Neither the term *industrial* nor the term *art* appeared in the message.

In 1983 the conversion to technology education continued to move quickly. Without a vote of the membership, the name of the AIAA's journal was changed to *The Technology Teacher*, and a professional improvement plan was approved which included goals to "advance the technology

education thrust" in the profession (Starkweather, 1983a, p. 8). The first of the 62 plan's "objectives and strategies" was to establish pilot technology education programs in at least 40 states (p. 9).

While Starkweather (1983b) noted that changes such as these were "evidence that the involvement of each AIAA member in the governance of the association can result in positive, constructive steps to advance the profession" (p. 2), he stated plainly that these changes were recommended by selected "current and former elected officers in AIAA"—not by the association's members (p. 2). By September 1983, a "Mission Statement for Technology Education" had been approved by the board (Starkweather, 1983a), and the new Distinction award was named the Distinguished Technology Educator award. Despite the Board's successes in using the term "technology education" for "industrial arts" in several important contexts, changing the name of the organization—which was sure to require a vote of the membership—remained to be accomplished.

The referee policy of *The Technology Teacher* was changed when the journal was rechristened in 1983. Whereas the *Man/Science/Technology* was "an refereed journal" for which "manuscripts are reviewed and approved by the Editorial Board before publication" (AIAA, 1981a, p. 1), *The Technology Teacher's* policy was to identify articles with bylines as "either refereed or invited unless written by AIAA officers on Association activities/policies." When changing the name of the organization became a major issue in 1984, this clause in the referee policy was exercised effectively the Board of Directors to rebut those opposed to such a change.

For example, when Swanson (1984) offered a one-page, eight-paragraph plea in the *TTT* to the profession to reconsider the impending name change (p. 2), the following four pages featured a 56-paragraph article by Lauda (1984)

advocating technology education (pp. 3-7). A disclaimer appeared at the end of Swanson's article: "The views expressed in this 'Perspective' are those of the writer(s) and do not necessarily reflect AIAA-approved policy" (p. 2). No such disclaimer was attached to Lauda's article.

This scenario was repeated two months later. "I join with Richard Swanson...in calling for a halt in the use of the term *technology education* to identify our field," Blankenbaker (1984) wrote. Again, the disclaimer regarding "AIAA-approved policy" (p. 2) followed his seven paragraphs, which were in turn followed by a 24-paragraph article about the "Call for Excellence" in technology education by Bensen (1984a).

It should also be noted that at this time the AIAA estimated that only ten percent of industrial arts teachers were AIAA members (Croft, 1983). Nonetheless, the AIAA Board appears to have viewed a change in the association's name as "a name change for the Association *and the profession*" (italics added) (Starkweather, 1983b, p. 2). In 1983 the AIAA's House of Delegates passed a resolution to investigate changing the profession's name (Snyder, 1992), but Starkweather implied that Board action in favor of technology education would continue "regardless of the outcome of this action" (Starkweather, 1983b, p. 2).

Within months, Bensen (1984b) reported the results of a survey of AIAA members regarding the name of the profession. In that survey, industrial-arts supervisors indicated that they felt *industrial arts* or *industrial arts and technology* were the most appropriate names for the profession; classroom teachers favored *industrial technology education*, followed by *industrial arts and technology* and, thirdly, *industrial arts*; and teacher educators favored *technology education* or *industrial technology education*.

Bensen noted that "the membership of the AIAA would consider a proposal to implement a change in the name of the organization" (1984b, p. 26), but it is clear that *technology education* was not the first, nor the second, name chosen by those surveyed. In addition, all three groups felt that the AIAA should remain "American," not "International" or "National." Within sixth months the American Industrial Arts Association had become the "International Technology Education Association" by membership vote.

Swanson (1984) well represented the opposition when he warned that "the technology education minority viewpoint dominating the industrial arts press is further confusing a confused profession" (p. 2). Interestingly, Smalley (1976) reported the results of a survey, performed by Gelina, which suggested that teachers might welcome a name change more readily than teacher educators—Swanson's "technology education minority."

Leading Figures in Technology Education Since 1985

The reader may note that the most articulate opponents to changing the name of industrial arts to *technology education*, notably Feirer and Swanson, lost prominence in the field after the name of the AIAA was changed.[11] In fact, of those not initially in favor of technology education, only Wright, a former proponent of industrial technology education, has remained very influential, eventually being elected president of the ITEA for 1995-1996.

A brief discussion of the contributions of several contemporary leaders in the field of general-education technology education will serve to orient the

[11]Bjorkquist, of course, is the current Chairman of the Mississippi Valley Industrial Teacher Education Conference.

reader to several of the current issues in the field. Two of the individuals most influential on technology education philosophy since 1985 (Kirkwood, Foster & Bartow, 1994) are biographed here.

Donald Lauda and the Technology Movement

In the aforementioned study to identify leaders in the field of technology education, one-fifth of the total votes in the time period 1985-1993 were cast for Donald Lauda (1937-), Dean of the College of Health and Human Services, California State University at Long Beach, giving him the highest percentage. As suggested above, Lauda was a champion of technology education nearly twenty years before the AIAA changed its name to the International Technology Education Association. After the name change in 1985 Lauda's influence continued to grow. He served on the Board of Directors from 1986-1992, and as ITEA president from 1990-1991.

Three years after graduating with a B.A.E. in industrial education, Lauda had earned a Ph.D. from Iowa State University and was the associate director of the Communications Center at the University of Hawaii. In all three of his degrees, Lauda majored in industrial education and minored in sociology. By the end of the decade he was an associate professor at St. Cloud State College in Minnesota, and was writing of the need for a fundamental change in industrial arts.

> It is fine to interpret industry for the student, but what is really needed is to interpret society from a technological standpoint and most of all understand how technology affects man (Lauda, 1969, p. 33).

Lauda was not the first to espouse these positions; as discussed earlier, such ideas are at least half a millennium old. But in 1969 social education was not a prevailing concept in industrial arts. Others, such as Scobey (1968), were

advocating a social view of industry and technology as the purpose for industrial arts, or had espoused technology as the field's content base (e.g. Warner, 1947; Olson, 1957).

More importantly, it bears repetition that in its general-education interpretation, industrial arts was to be a study of society and of cultures. Bonser and Mossman defined *industrial arts* as "a study of the changes made by man in the forms of materials...and of the problems of life related to those changes" (1923, p. 5); *technology education* was defined as an "educational program concerned with technical means...with industry...and their socio-cultural impacts" (AIAA, 1985, p. 25).

For whatever reason, the technology education profession continues, as exemplified by the above definition of *technology education*, to recognize the fundamental importance of social-industrial education. But this recognition is a theoretical one. The profession has "largely ignored" the "social purpose" advocated by Bonser and Mossman (Zuga, 1994, p. 83). Interestingly, as suggested earlier, Mossman considered industrial arts to be an integrated part of the social studies; Bonser saw industrial arts as a distinct field of the subject: "the social studies *Trivium*—history, geography, and civics—should expand itself into a *Quadrivium* by adding industrial arts..." (Bonser, 1927, p. 679); in either interpretation it is clear that industrial arts was regarded as a social study by its originators. Lauda advocated a similar interpretation.

Lauda's rationale and terminology in several ways resembled that of DeVore, and in 1969 and 1970 Lauda engaged in a year of postdoctoral studies at West Virginia University, where DeVore taught. A few years later Lauda became the department head at West Virginia. He later served as Dean of the

School of Technology at Eastern Illinois University, and since 1983 has held his current position in California.

As a recognized leader in industrial arts during the 1980s and 1990s, Lauda was invited to participate in two of the most influential curricula of the time, the Jackson's Mill industrial arts curriculum project (Snyder & Hales, n.d.), and the ITEA's Conceptual Framework for technology education (Savage & Sterry, 1991).

William Dugger, the Surveys of the Profession and the Standards Projects

Another educator considered to be among the most influential on the philosophy of the field is William Dugger, Jr., program leader of technology education at Virginia Polytechnic Institute. He is well-known as a program evaluator and author of elementary and secondary curriculum materials, textbooks, and articles.

Dugger was director of the Standards for Industrial Arts Project (AIAA, 1981c; see also Snyder, 1992), which aimed to develop industrial arts standards in line with the Vocational Education Act of 1963 (Dugger, 1980, p. 3). Contemporary with the development of the *Jackson's Mill* curriculum project, it was funded by the United States Office of Education in 1978 and completed in 1981 (AIAA, 1981c). The standards were later revised to reflect the American Industrial Arts Association's name change to the "International Technology Education Association" (Snyder, 1992), but the project did not receive government funding, and was funded by the ITEA instead.

In October 1994 Dugger was awarded a National Science Foundation grant to develop new standards for technology education. The project, currently titled "Technology for All Americans," is in part modeled on recent

attempts by members of the science and mathematics education professions to establish national standards for their subject areas (e.g. American Association for the Advancement of Science, 1993; National Council of Teachers of Mathematics, 1989).

In addition, Dugger coordinated a series of annual "surveys of the profession" which appeared during the 1980s and early 1990s in *The Technology Teacher* and *School Shop*. These surveys have often been used in the literature to show a lack of change in course offerings in the field over time (e.g. Komacek, 1992).

The survey was begun in 1985 as "School Shop's Industrial Education Survey" ("Participate in," 1985). The findings of the second annual survey were published simultaneously in *School Shop* and *The Technology Teacher* (Dugger, Fowler, Jones, & Starkweather, 1986). In the latter journal the results appeared under the title "Results of the Second Survey of *Industrial, Technical* and *Vocational* Teachers" (emphasis added). The article appeared after a 6-page editorial by ITEA Executive Secretary Kendall Starkweather which advocated a shift in practice away from the traditional industrial-arts philosophy (Starkweather, 1986) which permeated the results of the survey.

Although nearly eighty percent of the respondents to the 1986 survey were characterized as teaching "technology education" (Dugger, Fowler, Jones, & Starkweather, 1986, p. 10), the ten most popular courses identified were woodworking, drafting, general metals, architectural drafting, mechanical drawing, electricity, welding, electronics, automotives, and graphic arts (p. 11). The authors noted that little had changed since the 1978-1979 school year, when a similar survey was performed (p. 11). In fact, the five most common courses in 1988-89 were essentially the same as those ten years earlier (Dugger, French, Peckham, & Starkweather, 1991), and as they had been since at least

the early 1960s (Snyder, 1992, p. 117). The results made it clear that changes were occurring slowly. The surveys no longer appear in *The Technology Teacher*.

Relevant History Which Has Been Lost

As mentioned previously, the Bonser-Mossman-Russell social-industrial approach to industrial arts was never implemented on a large scale. But whether the subject could have been widely practiced is wholly unrelated to the fact that the original conception for industrial arts was as a social study. The failure of industrial arts historians to recognize works such as that of Welling and Calkins, Patrick, and other women with point-of-practice concerns for the elementary school has done more than simply obscure the role of women in the development of industrial arts. It has relegated the comparatively theoretical work of Bonser, Mossman, and Russell, upon which these theories were based, to the mounting collection of ivory-tower philosophies—laudable, but entirely impractical.

Historiographic Overemphasis on Bonser

In explaining why the social philosophy of industrial arts was never implemented,[12] Towers, Lux and Ray (1966) noted that "Bonser spelled out

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[12]Another real possibility for the lack of implementation of Bonser and Mossman's plan was their suggestion that industrial arts actually be part of a new school subject—social studies. For example, in a 1927 *School and Society* article, Bonser made his opinion of the place of industrial arts in the school curriculum clear:

> The social studies *Trivium*—history, geography, and civics—should expand itself into a *Quadrivium* by adding industrial arts as a representative of the basic social activities, more vital to immediate social participation than many of the questions of the other three fields or of any fusion of them into one (Bonser, 1927b, p. 679).

As previously indicated, Bonser , like Mossman, favored an active, progressive, project-

[note continued]

the major subdivisions of content, such as the activities to provide food, clothing, and shelter, but he did not develop a complete subject matter structure" (p. 106). But others, such as Welling and Calkins (1923), Wells (1921) and Krackowizer (1919) fleshed out Bonser and Mossman's theories. But by focusing only on Bonser, historians have been able to rationalize the profession's lack of attention to the social-industrial conception thusly: forced to choose between Bonser's weak and incomplete content structure and the established, proven, and well-regarded practices in manual education, the profession's only chance for survival was to ignore some or all of Bonser's theories. Towers, Lux, and Ray went on to credit Warner with continuing the Bonser and Mossman tradition (1966, p. 107). Petrina and Volk (in press) provide a different view which deserves attention, suggesting that the profession generally, and Warner specifically, had the opportunity to implement a more progressive, cultural industrial arts. Warner clearly

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oriented classroom. Although he specifically advised against making industrial arts the core of the elementary curriculum (Bonser, 1927a), he emphasized exactly the same qualities in classroom projects as he did in objectives for industrial arts. "He believed," Mossman (1931) noted, "that...the study of industry is truly cultural" (p. 4).

> The study of industrial arts is a factor in educating for citizenship in just the degree that it yields an understanding of meanings and an appreciation of values significant for the direction of conduct in individual and social life" (Bonser, 1922, p. 125).

Bonser and Mossman also noted that in addition to the derivation of industrial arts content from society, industrial arts methods might also be socially determined.

> The earliest form of the social impulse is ... the desire to be with others. Gradually the desire grows in one to share with others what they are doing and to have others participate in one's own activities. It is found through experience that others may help one to carry on one's own plans, and that there are definite values in group coöperation. Exchanges of ideas are profitable, and division of work in a problem of common interest results in the achievement of much more in both quantity and variety in a given time than one could accomplish alone (Bonser and Mossman, 1923, p. 38).

regarded the Bonser-Mossman-Russell interpretation as his prime influence (e.g. Warner, 1928), but he "disregarded much of their vision" (Petrina & Volk, in press)—including the social-industrial conception.

Even in the elementary school, the Bonser-Mossman philosophy was at times misconstrued. In elementary-school industrial arts, sometime after Bonser's death, "there was a transition toward an arts and crafts and/or handicrafts approach. It is probable that this approach, as well as the 'method of teaching' approach, stemmed from an out-of-context application of the Bonser philosophy" (Hoots, 1974, p. 234).

Traditionally, industrial arts in the elementary school has been taught by an industrial arts "specialist—" not by the classroom teacher. Bonser and Mossman warned against such practice. "The industrial arts work makes so many demands upon arithmetic, geography, history, and English, and likewise contributes so much in furnishing motives and problems for these subjects, that the teaching of all these by the same teacher in a given grade is essential... Because of its extensive relationships, industrial arts, of all subjects, should not be taught by a special teacher" (Bonser and Mossman, 1923, p. 74).

Since that time, Hoots wrote, "many attempts have been made to teach elementary school industrial arts by specialists through a variety of methods... One might say that for a period of approximately forty years elementary industrial arts people have tried to prove Bonser wrong on this point, but they were unable to do so" (1974, p. 235).

Hoots (1974) added that "the manner of presentation utilized by Bonser was somewhat difficult to follow and somewhat difficult to implement" (1974, p. 227). Bawden (1950) pointed to the "problem of organization" as to why "it was inevitable that Dr. Bonser's proposals should meet a varied

reception" (p. 44). Again, the question may be raised as to whether Bonser alone could have been expected to develop a broad vision *and* a plan for implementation. Olson (1963) noted that "inconsistencies" between traditional ideas and Bonser's interpretation "became increasingly annoying to teachers and leaders in these fields" (p. 9-10).

To be fair, it should be mentioned that Bonser himself may have been regarded by his colleagues as "somewhat difficult to follow." Well-known educator William Kilpatrick frequently wrote in his diaries of Bonser, often complimenting his ideas, but criticizing their organization or presentation. For example, in 1912 Kilpatrick went "to hear a discussion on Bonser's 'Industrial Arts.' He was good, but in my opinion there is yet need of study to clarify the ideas involved" (1912, p. 78).

To some degree, the ideas involved *were* clarified—but not by Bonser alone. The burden placed on Bonser to do so is unreasonable per se; it is more unreasonable in light of the facts that he did not develop either of his two major works on industrial arts alone; that he died at the height of his career; and that he had many educational concerns other than industrial arts.

This last point deserves more detailed attention. In the history of industrial arts/technology education is has been repeatedly noted that Bonser had no background in shopwork or drafting, had never worked in industry, had not been trained as a teacher of industrial subjects, and had never taught those subjects to schoolchildren (e.g. Mossman, 1931).

Two letters from Maurice Bigelow, Teachers College Director of Practical Arts to Dean Russell illustrate that as early as seven years before the publication of *Industrial Arts for Elementary Schools*, the breadth of Bonser's interests was causing considerable trouble in assigning him to a school within the college. Bigelow argued that "we very much need Professor Bonser [in

industrial arts] ...even if some of his attention is in the future to be centered on Elementary Education" (Bigelow, 1916, p. 1). This request was granted by the Board of Trustees. Even so, and despite Bonser's being "the best man in the country on Practical Arts Education in general," his main concern was not industrial arts, Bigelow would write later to Russell. "Teachers College and Professor Bonser made a great mistake when it was decided that he should be transferred to Elementary Education" (Bigelow, 1920, p. 1).

The Original Conception of Industrial Arts

It is clear that Bonser and Mossman (1923) intended industrial arts to be general education for all boys and girls, *at the elementary level.* Industrial arts, they wrote, "is not a special subject,...but, quite the contrary, it is rather the most general of all in its far-reaching relationships" (p. 74). It is also certain that modern technology education can be traced directly back to this philosophy and to Bonser and Mossman (Householder, 1989; Volk, 1993b; Lewis, 1994). Finally, it is clear that their work built directly upon the "Social-Industrial Theory" of Bonser and Russell, and Dewey's psychology of occupations (see McPherson, 1972, Chapter V); and that it was consequently an expression of the philosophy of Teachers College in the 1920s.

But Bonser and Mossman also saw a clear vocational purpose for industrial arts. Some of their specifications for the field are discussed below. The reader may note that many of the issues they were concerned with remain problematic today.

Gender Issues

In their *Industrial Arts for Elementary Schools*, Bonser and Mossman raised this question: "is there not also a body of experience and knowledge

relative to the industrial arts which is of common value to all, *regardless of sex* or occupation?" (emphasis added) (1923, p. 20). Bonser and Mossman both attempted to abandon gender-specific terminology, such as masculine pronouns: "it is found through experience that others may help one to carry on one's own plans..." (1923, p. 38). Despite his generic use of the term "man" in his definitions of "industrial arts" from 1920 to 1930 (e.g., "changes made by man in the forms of materials..."), there is reasonable evidence that Bonser did not hold many of the prevalent beliefs of the time regarding men and women.[13]

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[13]It should be noted that Bonser's work with women such as Bentley, Mossman, and others, his marriage to a Unitarian minister and author of several books, and his advocacy of industrial arts and home economics for both boys and girls tell only half of the story. Indeed, Bonser would not be considered a feminist by today's standards. "The adolescent girl has a very receptive ear to the advice that she think of an individual career, that she prepare herself for independent self-support," he wrote months before his death. "...That such advice is often given to high school girls by faculty advisers and deans of girls is so frequently reported that we can not doubt it. Now this whole situation is serious, and it is wrong—just as wrong as can be" (1932, p. 265).

McPherson (1972) noted that during 1930, Bonser's ideas relative to the education of girls "found its way into the local newspapers" of New York, and that "Bonser drew much personal criticism for his own criticisms of faculty advisors and deans of girls" (p. 233). Among those who publicly denounced Bonser's comments was New York City's Director of Homemaking Education, Martha Westfall. But perhaps Marguerite Marshall's comments on Bonser's ideas were most pointed:

[note continued]

Organization at Various Grade Levels

Warner is usually credited with instigating the movement toward technology education through his development of a sustaining theory and his implementation of general shop facilities at the Ohio State University. Warner was a student of Bonser at Columbia, and Bonser's ideas are amply evident in Warner's thinking. Gemmill notes that when "William E. Warner fostered the general shop movement...He pointed toward Frederick G. Bonser's five kinds of activities as allowing for a well organized general shop" (1989, p. 2). Warner's general shop was a direct adaptation of Bonser's theory.

While at Western Illinois at Macomb, Bonser is credited with organizing "the first general shop (multiple activities)" (Luetkemeyer & McPherson, 1975, p. 263). It seems likely that Mossman and perhaps Bentley, actually organized the room, in which students experienced activities which at the time were termed "shopwork," "drawing," and "home economics." It seems clear, however, that Bonser and Mossman[14] were more interested in connections with regular school subjects than in imparting tool skills to students (see Coffey, 1909b). "The social and liberal elements in the study of the industrial arts," Bonser wrote a few years later in a rejection of shopwork, "are more significant than are the elements involved in the mere manipulation of materials" (1910, p. 28).

Probably the first fallacious argument—well over fifty years old—against the higher education of women in the United States was that it would spoil them as wives and mothers. Yet now modern women of intellegence—educated themselves and with daughters being educated—must again listen to this charge, exhumed from the moth-balls and waved to the Spring breezes by Dr. Frederick G. Bonser of Teachers College (quoted in McPherson, 1972, p. 234).

[14]Mossman was unmarried at the time, and references to her works are to "Coffey."

But the general shop was to be used only when the classroom would not suffice. Referring to Bonser and Mossman's "elementary school industrial arts program," Hoots (1974) noted that "The classroom teacher is considered the key to the success...since it is the elementary classroom teacher who knows the total curriculum and who knows the children, it is the classroom teacher who logically must conduct instruction in industrial arts" (Hoots, 1974, p. 223)

General Education

Focusing increasingly on the elementary grades at Macomb, Bonser and Mossman began to systematize the study of industrial arts in the elementary school. Although they did not use the term "general education," they repeatedly referred to industrial arts as being an essential to a complete education. Bonser and Mossman emphasized that all citizens "must know how to read, write, and use the general process of number; all need to know the more permanently important facts and meanings of geography, history, literature, and science as these enter into daily life and intercourse. Is there not also a body of knowledge relative to the industrial arts which is of common value to all(?)" (Bonser and Mossman, 1923, p. 20).

"Because of its very extensive relationships," they wrote, "industrial arts, of all subjects ... is not a special subject in the sense of being unrelated to other subjects, but, quite the contrary, it is rather *the most general subject of all* in its far-reaching relationships" (Bonser and Mossman, 1923, p. 74; emphasis added).

General and Vocational Aims for Industrial Arts

For many years industrial arts has been regarded as general education. A majority of industrial arts and technology education literature produced during this century has come from three sources, all of which have consistently characterized industrial arts as general education. These sources of information are the American Vocational Association, the American Industrial Arts Association (now the ITEA), and the US federal government.

But even if industrial arts was general in theory, the strong similarities between vocational industrial education and industrial arts and greatly expanded funding opportunities for high-school programs which demonstrate attainment of vocational objectives have served to blur whatever theoretical line there may have been between vocational and general industrial education.

In 1938 Smith suggested that a strong distinction between the two need not be made, and predicted that the distinction would become less important in the future.

> There are two complimentary phases or kinds of industrial education—the general or industrial arts phase, and the strictly vocational or training phase. These should be thought of, not as mutually exclusive and different offerings, but as closely allied and interdependent parts of a complete service...The early federal aid practices tended to hold them apart, which, I think, was well advised in the beginning. For the years ahead a closer union of the two seems not only a wiser course but a plan in process of realization. Ultimately we shall have more state and more federal aid for this work in support of well-founded programs without regard to their constituent elements. The criteria for aid will be goodness of concept, worthiness of effort, and effectiveness of placement and adjustment result. It will be a matter of service rendered to existing, needy groups. There will be lateral and vertical integration (p. 11).

Although some would point to the ITEA's continued success in maintaining a general-education focus in contesting the suggestion that to a degree Smith was right, it must be conceded that more recent authorizations of the federal aid have included technology education as a consituent of vocational education, and that whether a high-school technology program's official intent is general or not, such programs are eligible to receive federal vocational aid, and have been for at least twenty years (see Good & Good, 1981).

Roberts (1971) viewed arguments such as Smith's as closely resembling the opinions of general educators, who, he wrote, "maintain that there is little difference between industrial arts and vocational industrial education and that the trend is for these two subjects to become more and more alike" (p. 316). Roberts went on to suggest that industrial arts and vocational industrial teachers viewed their programs as distinct. But, echoing Smith, Roberts suggested that ultimately the distinction "is one of purpose" (p. 317)—industrial arts, he suggested, was a component of general education.

The American Vocational Association long considered industrial arts to be the general-education counterpart to vocational industrial education. "Industrial arts should always be conceived and practiced as general education, for youth and for adults," read an 1946 AVA publication (p. 50). Other AVA industrial arts publications (e.g. AVA, 1934; 1968) supported the same position. Similarly, US government documents have considered industrial arts to be a "phase of the curriculum in general education" (US Department of Health, Education, and Welfare, 1968, p. 2). Proffitt (US Department of the Interior, 1937), Schmitt and Pelley (1961), and most other federal publications take similar views. The rationale for such a view is typified by a 1953 AVA publication:

> Industrial arts is considered a part of general education not because of an indefinite "general" nature and not because it pursues objectives which are similar to those of long-accepted "general education subjects." Rather, industrial arts is part of general education because it derives its content from industry—a basic element of our culture—and because it has as its social purpose the greater understanding and better control of the phenomena of industry (AVA, 1953, p.10).

An ammendment to the standing US federal Vocational Education Act in 1976[15] is considered to have solidified the eligibility of industrial arts programs for federal vocational funding, although such programs were technically qualified for such aid a few years earlier when the Vocational Education Act of 1963 and its 1968 ammendments were further ammended in late 1973 (see Ray, 1978; Steeb, 1979). Frantz (1982) viewed the inclusion of industrial arts in the 1976 ammendments as a suggestion that industrial arts had "a major contribution to make to vocational education in helping students to (a) gain an understanding of the industry and technology...and (b) discover the interests and talents they can use in making a contribution to our industrial society" (p. 131).

Attempts at Integration in Technology Education

It should be clear from the foregoing that the original conception of inductrial arts viewed the subject as ideally being completely integrated with the rest of the school curriculum. Currently, several avenues of integration are being persued. Two major examples are discussed below.

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[15]PL 94-482. §104.591, *Use of funds*, and §104.592, *Industrial arts programs*, are the pertinent subsections.

Science, Technology, and Society

An educational movement related to both science and technology is the Science-Technology-Society (STS) movement. When invited to write an article in the *Journal of Technology Education,* STS pioneer Rustum Roy characterized STS as "an approach to 'science' education" (p. 14) and "*learning science* through contact with applied science (italics added)" (p. 15).

As Roy suggests, the science-technology-society movement is primarily a context for science instruction. "Science-Technology-Society has been called the current megatrend in *science education,*" noted Robert Yeager, former president of the National Association for Science, Technology, and Society (NASTS). Yeager went on to observe that "others have called it a paradigm shift for the field of *science education*...the National Science Teachers Association (NSTA) called STS the central goal for *science education* in its official position statement for the 1980s..." (1993, p. 145; emphases added).

Technology education professionals, conversely, have largely viewed STS, so far as it relates to their own field, as social education. Because technology education already has a strong emphasis on science, it may superficially appear that the only parts of STS which technology educators are not covering are the social aspects of technology.

Some work has been done in the area of furnishing the profession of technology education with literature related to this movement. STS has been characterized as a teaching strategy for technology education (Gilberti, 1992); the Council on Technology Teacher Education (CTTE) has made technology and society the theme of its 1996 yearbook; and the profession's periodicals continue to publish related articles. Furthermore, during 1993 and 1994 Karen Zuga, a leader in technology education, served simultaneously on the boards

of directors of NASTS and ITEA. But in general there seems to be no strong indication that the technology education field as a whole is interested in a philosophical shift in the direction of viewing technology from a sociological vantage.

Presently the direction many the field appear to be espousing most clearly is mathematics-science-technology (MST) integration. To many, technology education has a"stated role of providing interdisciplinary settings for the applications of mathematics and science concepts" (Daugherty and Wicklein, 1993, p. 30).

Math, Science, and Technology

As Daiber (1992) has noted, the integration of math, science and technology "is the most typical form of integration that has been presented to technology teachers" (p. 171). Daugherty and Wicklein (1993) recently refered to technology education's "stated role of providing interdisciplinary settings for the applications of mathematics and science concepts" (p. 30), describing "mathematics and science" as "disciplines with which we choose to associate" (p. 30).

Industrial arts teachers have been integrating mathematics and science concepts and content into their curricula for years. A brief overview at the history of the integration of math and science in industrial arts instruction will be presented before the present and future are considered.

History of Mathematics and Science Integration in Industrial Arts

In Bonser and Mossman's *Industrial Arts for Elementary Schools* (1923), the authors discussed in detail projects which would serve to integrate the school subjects. While recognizing that "most school subjects had their

origin in practical needs" and that "each prominent aspect of life is organized into a subject of study," (p. 67), they maintained that "it is very artificial and wasteful to separate each entirely from the others in teaching" (p. 73):

> The industrial arts work makes so many demands upon (the other school subjects), and likewise contributes so much in furnishing motives and problems for these subjects, that the...teaching of each is made more easy and effective by the use of the others (74).

Integration of all of the other school subjects appears to have been Bonser and Mossman's goal. However, in light of industrial education's historical partiality toward the technical aspect of technology at the expense of more humanist perspectives (Petrina, 1992; Zuga 1992), it is not surprising that integration with math and science became prevalent in interdisciplinary considerations.

In his 1919 book *Principles and Methods of Industrial Education*, Dooley devoted a chapter each to teaching children science and math "in the shop." Griffith (1920) noted that "industrial arts teachers must remember that their subject is to be justified...by the extent to which it enables students to formulate" concepts relative to the sciences (p. 203-204). Some industrial arts leaders also advocated "education in the scientific method" as part of industrial arts (e.g. Struck, 1938). Math integration had among its champions Schweickhard (1929), who discussed the educational need for real-world applications of mathematics, and the role of industrial arts in fulfilling that need:

> the fundamental operations in mathematics, if properly presented, will function when ocassion demands in real situations. The manipulative phases in industrial education...(present) the real demands for the use of mathematic operations, before they have had a chance to get "cold" in the pupil's mind (p. 97).

Friese (1946) outlined an integrated course in machine-shop-related mathematics being taught in Pennsylvania. That course and others like it, he wrote, "attempted to solve the problem of what to teach in related mathematics...and yet maintain regular contacts with shopwork in machine shop..." (p. 279). Both Friese and Schweickhard also discussed the teaching of science in industrial arts.

It's a well-worn story that the launches of *Sputnik I* and *II* in 1957 alarmed US education pundits, who quickly called for more math and science education for American children. *Sputnik* had two major effects on industrial arts. One was an increase in literature references to the values of democracy and capitalism (e.g. Spencer, 1959); the other was an increased emphasis on science and math—"it was especially at this time that a relationship between industrial arts and these subjects was sought" (Sredl, 1964, p. 211).

At the time, *The Industrial Arts Teacher*, the official journal of the NEA-affiliated American Industrial Arts Association, was replete with articles advocating the integration of math, science and technology. In volume 18 alone, Maley suggested that industrial arts teachers "must accept the basic fact that mathematics and science (can benefit from) a truly significant contribution by industrial arts" (1959, p. 12); Paton, calling for more math and science training for industrial arts teachers, noted that "industrial arts has moved from the simplicity of the frontier craft shop to the complex maze of scientific production" (1958, p. 17); and Knight wrote that "industrial arts shops may become excellent laboratories where...the practical applications of scientific principles can give depth to understandings" (1958, p. 18).

By the 1960s, the emphasis on math-science-technology integration in industrial arts became increasingly involved. Swanson (1965) wrote that "industrial arts curriculum builders have followed three general approaches

in drawing content from mathematics and science" (p. 51). These, he said, were "special emphasis on problems calling for applications of science and mathematics;" "illustration and testing of scientific-mathematical principles;" and "adoption of certain parts of mathematics and science (content)" (p. 51). Swanson discussed each of these in detail.

During this time a related pattern in industrial arts curriculum development began to emerge. As exemplified by Householder (1972), industrial arts curriculum developers would point to curricula in math and science. The tendency to compare curriculum and content structure with science education continues today (e.g. Wright, 1992). Although in the early 1980s a temporary focus on the sovereign content of industrial arts corresponded with a reduction of interdisciplinary considerations, by the time the name *technology education* was adopted by most industrial arts educators, technology, math and science were by far the subject matter areas most discussed in the industrial arts literature.

Present Emphasis on Math, Science, and Technology

The benefits for technology education commonly ascribed to M/S/T may be summarized as follows. ITEA past-president Householder (1992) suggested that M/S/T could "enable the profession (technology education) to take advantage of funding opportunities currently available only in science and mathematics" (p. 8). Wescott (1993) noted that "the current emphasis on mathematics and science provides a unique opportunity for technology education to establish itself as a viable discipline to be studied by all students" (p. 177).

M/S/T researchers LaPorte and Sanders (1993) mentioned benefits including elevating technology education to the status of academic subjects in

the middle school; Sinn, Walthour and Haren (1993) suggested that "education about technology, science, mathematics and quality" is "part of the historical basis of American greatness in education and industry" (p. 29).

Recently Petrina (1993) ascribed a "discipline envy" to leaders in technology education. While his contention that technology education is not a discipline is logical, it is nonetheless unpopular. Use of the term "discipline" to refer to industrial education was typical of the early 1980s (e.g. Balisteri, 1982; Lauda, 1982; Hales & Snyder, 1982) and is now more common than ever. Many in the profession have for some time advocated the "disciplining" of technology and technology education; clearly math and science are disciplines. Technology educators may find M/S/T attractive insofar as it allows the field to associate with what it aspires to be.

Technology education at present appears to interface well with mathematics and science. It has the hands-on activities (Korwin & Jones, 1992) desired by math and science educators. When the National Council of Teachers of Mathematics (1989) uses terms such as *communication* and *problem-solving*, technology educators readily recognize direct connections to their own subject matter. They applaud the American Association for the Advancement of Science (Johnson, 1989) for assembling a technology panel to draft a report which views technology content as "the basis for a major revision of US education" (p. xi).

One of the ways in which the integration of mathematics and science in technology education is being accomplished is through teacher education. The Council on Technology Teacher Education, in conjunction with NCATE, has put into effect teacher preparation guidelines which "clearly emphasize the importance of the integration of science, technology, and mathematics" (Gloeckner, 1991, p. 80); Householder suggested "the preparation of teachers of

mathematics, science, and technology in a unified undergraduate program" (1992, p. 8).

Teacher training in an educational field which is changing as rapidly as technology education might be expected to be problematic. Currently the field of industrial arts/technology education is is facing a serious lack of qualified applicants for teaching positions.

Implications for Teacher Training

In 1992, Householder (1993) noted, only 706 students graduated from technology teacher preparation programs at colleges and universities in the US—a decrease of as much as 25 percent from just one year prior (p. 14). In an earlier publication, Householder (1992) noted that Rex Miller found that 1,057 industrial arts/technology teachers graduated the previous year, down from 1,520 the year before that. Although the two used different methodologies, the comparison of Miller's figure of 1,520 graduates in 1989 and Householder's 706 in 1992 suggest a drop of over 50% in three years.

Volk (1993a) investigated the period 1970-1990 and found that the graduation figures from industrial arts/technology education programs which did not offer non-teaching industrial-technology degrees decreased at roughly the same rate as the other areas of undergraduate teacher training programs. These programs experienced a 53 percent reduction in undergraduate degrees awarded in that time period, compared with a 73 percent decline for programs offering the non-teaching industrial-technology degree (p. 51).

A comparison of recent technology teacher education enrollments with figures from forty years ago indicates that the decline noted by Volk and Householder probably began well before 1970.

Enrollment Trends in Historical Perspective

Householder (1992) determined that in 1992, 3,220 students were enrolled in 139 technology or industrial arts teacher education programs in the US. Williams and Meyer (1952) collected similar data for the first yearbook of the American Council on Industrial Arts Teacher Education.

Forty years ago, colleges and universities in Missouri, Pennsylvania, Ohio, and California alone enrolled 3,000 full-time undergraduate industrial arts teacher trainees. Four colleges in New York enrolled a total of 1173 full-time undergraduate industrial arts majors; slightly more were enrolled in Illinois schools. Schools in Texas reported full-time enrollment of about 1,600 students. (Williams and Meyer, 1952)

Furthermore, four of the six Florida universities which reported data in 1952 enrolled a total of 202 full-time industrial-arts majors. Householder (1993) found that in 1992 only three students in the state of Florida were enrolled in technology education or industrial arts teaching programs.

In addition, these figures understate actual 1952 enrollments. The editors of the 1952 ACIATE yearbook noted that the typical teacher education program enrolled "about 100 industrial arts majors, some full-time, and some part-time students, reasonably equally divided" (Williams & Meyer, 1952, p. 5). So the above enrollment figures from 1952—which are being compared with figures from 1992 which presumably include both part-time and full-time students—are at best a serious understatement of the total part-time and full-time enrollments in 1952. In addition, many programs did not provide pertinent data, so in some cases statewide enrollment figures do not include all schools in the state. Similarly, Householder's (1992) survey had a 93% return rate.

Finally, Williams and Meyer determined that over 1,000 educators were employed as industrial arts teacher educators in 1951, up from 604 ten years before (1952, p. 2); Householder (1992) identified 234 such positions in 1991.

Proposals to Remedy Enrollment Problems

The International Technology Education Association (ITEA) originally planned to make the last of its five goals for the period 1990-1995 to "increase the number and quality of people teaching technology" (1990, n.p.). Unfortunately, the ITEA did not make the recruitment of any specific number of teachers a goal. The 1994 version of the strategic plan makes no mention whatsoever of teacher recruitment (ITEA, 1994).

As a response to the problem, Householder (1993) suggested that the problems of recruitment and teacher education program structure be addressed. The recommendations for models of technology teacher preparation advanced in his 1993 work are essentially those presented more fully in Householder (1992). They include the Holmes model, the unified preparation of math/science/technology teachers, inservicing teachers of other subjects, and recruiting military retirees.

Volk, noticing a steadiness in the decline he identified, extrapolated the current rate of decline and determined that the "demise of the profession will occur near the year 2005" (1993, p. 57). Volk's immediate recommendations for ameliorating the obvious problems in technology teacher education centered on further research.

So while Householder (1993) suggested that "in any event, the future offers bright prospects for the field if members move quickly" (p. 19)—Volk (1992) warned that "with the continued decline in technology educators being

prepared and the changing emphasis in program options, the very survival of the profession is at stake" (p. 58).

SUMMARY

Historical Problems in Industrial Arts and Technology Education

Since the last book-length history of technology education or industrial arts was published (Barella & Wright, 1981), much of the field changed its name, and several avenues of historical research have been pursued, the results of which conflict significantly with prior and accepted histories. Additionally, the Barella and Wright book was sanctioned by the American Industrial Arts Association, and as such may not provide a comprehensive perspective.

Snyder's (1992) dissertation sought to provide a history of the field which reflected the period following the publication of the Barella and Wright work. But the time period his work considers begins early in the stone age—the dissertation covers nearly a million years. One of his six chapters begins during the Industrial Revolution and ends in the 1970s, and appropriately, a majority of Snyder's history takes place during the last 30 years. The focus of the study is on the "transition" to technology education in 1985, and as such is concerned primarily with the general education perspective.

In addition, since 1992, new material has surfaced. For example, Petrina and Volk (in press) reasonably demonstrated that Warner, clearly the field's most influential leader for several decades, ignored or subverted many of the principles which histories of industrial arts credit him with promoting.

A problem brought to light by this is the profession's lack of a comprehensive account of the historical and philosophical trends which converged to form technology education as it stands today.

Implications for Further Study

As noted in the first section of this paper, industrial arts is often considered to have evolved from manual training and manual arts. Brown (1977) and others dispute this. Part of this present difficulty may lie in overuse of the term "industrial arts" during the 1920s and 1930s. During and since that time, Warner is considered to have advanced the ideals of Bonser and Mossman (e.g. Towers, Lux & Ray, 1966). Petrina and Volk (in press) have amassed much evidence to suggest that Warner in fact ignored the essential components of the Bonser and Mossman conception. What this says of post-Warner general-education industrial arts and technology education and its supposed conviction to Bosner and Mossman (e.g. Volk, 1993b) demands more study.

Meanwhile, Warner had adversaries who viewed industrial arts as vocational, or at least partly so. That Warner had detractors is well known. But the legacy of the reaction to Warner has been overlooked. Warner's adversaries did not disappear. The successes of the American Vocational Association's Technology Education Division and the National Association of Industrial and Technical Teacher Educators indicate that significant theoretical development in technology education has been based on a conception of industrial arts that differed from that of the AIAA and ITEA.

In terms of history, advocates of the general-education view of technology education are probably correct to claim Bonser and Mossman as their forebears. But Bonser and Mossman clearly viewed industrial arts as vocational in the upper grades. The story of the development of their ideas has been misrepresented in this and several other ways. For example, Russell is probably given too much credit for the development of the "Social-Industrial Theory." As noted in the second section of this paper, the

fundamental justification for the claim that Russell was the prime author of his monograph with Bonser is that Bonser could not have been the primary author and that this assumption is disproven by synthesis of information from several sources.

It seems probable that Russell visited Bonser's normal school in Illinois, then immediately returned to New York and wrote the article which would become his contribution to *Industrial Education* (Russell & Bonser, 1914). Later, at Bonser's funeral, Russell reminded those in attendance that Bonser merely helped in the conception of the ideas in the pamphlet. But exactly who wrote what is at this point inconsequential. What makes all of this significant is that the ideas upon which the social-industrial conception of industrial education—and, perhaps industrial arts itself—was founded were likely Mossman's. Did a woman develop the original conception of industrial arts? By now this question should have been addressed; clearly this needs further research. Mossman was the Macomb teacher who set up the program with which Russell became enamored, and with which McPherson's (1972) evidence suggests Bonser should be credited.[16]

If Bonser and Mossman's ideals were ignored or subverted by Warner, what does the AIAA's name change in 1985 represent if not a philosophical return to Bonser and Mossman—an ironic rejection of Warner, whom, it is

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[16]Of course, the speculation only begins here. Russell hired Bonser in January, 1910 for the following September to direct the Teachers College training school—but is the reason Mossman suddenly decided to quit her job during the summer of 1910, and go to New York for September the fact that Bonser couldn't replicate the results without her? Is this why Bonser agreed to write the book with Mossman?

often recalled, used the term "technology" to denote the content of industrial arts in the 1940s? This would seem to be an independent indication that histories of technology education which suggest that Warner is the link between Bonser and Mossman and present-day technology education should be reconsidered.

Interestingly, Lauda (1969), DeVore, and others, were using rationales for technology education in the 1970s which were very similar to those of Russell, Bonser, and Mossman during the 1910s and 1920s. These rationales were essentially based on the assumption that a technological (or industrial) society demanded social technological education. The fact that Lauda, DeVore, and others found it necessary to voice this concern may be another indication that, at least at that time, the AIAA did not represent the Bonser and Mossman conception of industrial arts.

It seems clear, then, that much work needs to be done in the history of general industrial education in the US. Without understanding the history of its ideals, the field is at a disadvantage when trying to apply its model of technology education to present and future problems.

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